

## CLAIMS

1. A dust testing facility for testing environmental dust affects upon a motor vehicle, comprising:

a dust testing chamber having an interior chamber space structured to receive therewithin a motor vehicle, said dust testing chamber  
 5 comprising a ceiling, an oppositely disposed flooring group and a plurality of sidewalls disposed between said ceiling and said flooring group, said ceiling, flooring group and sidewalls collectively defining said interior chamber space;

an air supply system configured to supply flowing air to said dust  
 10 testing chamber;

a dust supply system configured to provide a mixture of fluidized dust and compressed air;

a dust spray system mounted within said dust testing chamber and connected to said dust supply system, said dust spray system being  
 15 configured to provide clouding of the dust within said interior chamber space in response to receiving the mixture of fluidized dust and compressed air from said dust spray system; and

a dust recapture system connected between said flooring group and said air supply system and further connected with said dust supply  
 20 system, said dust recapture system comprising:

said flooring group comprising a floor grating;  
 a plenum below said floor grating; and a plurality of return ducts interfaced with said plenum and fluidically communicating with said interior chamber space  
 25 through said floor grating;

an air filtration unit structured to filter air and the dust from said flooring group and allow the

30                                a return dust fluidizer structured to fluidize the  
dust from said plenum and return the dust to said dust  
supply system.

2. The facility of Claim 1, wherein said plenum comprises a plurality of acutely angled plenum walls defining a gravitational low point running along a length of said dust testing chamber; wherein each return duct of said plurality of return ducts is located, respectively, at each gravitationally lowest point, and wherein said plurality of return ducts communicate with said air filtration unit.

3. The facility of Claim 2, wherein said dust comprises road dust having a size range between substantially zero and 180 microns.

4. The facility of Claim 2, wherein said air supply system comprises:

a fan unit fluidically communicating with said air filtration unit in upstream relation therewith; and

5                    temperature and humidity regulation components connected with  
said fan unit in downstream relation therewith, said temperature and  
humidity regulation components imparting the flowing air with  
predetermined values of relative humidity and temperature;

wherein said air supply system is selectively adjustable to provide  
10 an air pressure of said interior chamber space which is below atmospheric  
pressure.

5. The facility of Claim 4, wherein said air flow system further comprises a plurality of vents mounted to said ceiling; and wherein said dust

spray system comprises a plurality of dust spray nozzles located adjacent said ceiling.

6. The facility of Claim 5, further comprising a source of back air pressure connected to said air filtration unit which is selectively activated to purge said filtration unit of dust and thereby locate the purged dust in said return dust fluidizer.

7. The facility of Claim 6, further comprising a leak detection device connecting into said interior chamber space through a portal formed in a selected said sidewall.

8. A dust testing facility for testing environmental road dust affects upon a motor vehicle, comprising:

a dust testing chamber having an interior chamber space structured to receive therewithin a motor vehicle, said dust testing chamber  
 5 comprising a ceiling, an oppositely disposed flooring group and a plurality of sidewalls disposed between said ceiling and said flooring group, said ceiling, flooring group and sidewalls collectively defining said interior chamber space;

an air supply system configured to supply flowing air to said dust  
 10 testing chamber;

road dust having a size range between substantially zero and 180 microns;

a dust supply system configured to fluidize said road dust and provide a mixture of fluidized road dust and compressed air;

15 a dust spray system mounted within said dust testing chamber and connected to said dust supply system, said dust spray system being configured to provide clouding of said road dust within said interior chamber

space in response to receiving the mixture of the fluidized road dust and compressed air from said dust spray system; and

20               a dust recapture system connected between said flooring group and said air supply system, wherein the road dust sprayed into said dust testing chamber by said dust spray system is returned to said dust supply system, and wherein the flowing air introduced into said dust testing chamber is recycled to said air supply system.

9. The facility of claim 8, wherein said dust recapture system comprises:

                  said flooring group comprising a floor grating; a plenum below said floor grating; and a plurality of return ducts interfaced with said plenum  
5               and fluidically communicating with said interior chamber space through said floor grating;

                  an air filtration unit structured to filter air and said road dust from said flooring group and allow the flowing air to recyclably pass into said air supply system; and

10              a return dust fluidizer structured to fluidize said road dust from said plenum and return said road dust to said dust supply system.

10. The facility of Claim 9, wherein said plenum comprises a plurality of acutely angled plenum walls defining a gravitational low point running along a length of said dust testing chamber; wherein each return duct  
5              of said plurality of return ducts is located, respectively, at each gravitationally lowest point, and wherein said plurality of return ducts communicate with said air filtration unit.

11. The facility of Claim 10, wherein said air supply system comprises:

a fan unit fluidically communicating with said air filtration unit in upstream relation therewith; and

- 5                    temperature and humidity regulation components connected with said fan unit in downstream relation therewith, said temperature and humidity regulation components imparting the flowing air with predetermined values of relative humidity and temperature;

                    wherein said air supply system is selectively adjustable to provide  
10    an air pressure of said interior chamber space which is below atmospheric pressure.

12. The facility of Claim 11, wherein said air flow system further comprises a plurality of vents mounted to said ceiling; and wherein said dust spray system comprises a plurality of dust spray nozzles mounted to said ceiling.

13. The facility of Claim 12, further comprising a source of back air pressure connected to said air filtration unit which is selectively activated to purge said filtration unit of said road dust and thereby locate the purged road dust in said return dust fluidizer.

14. The facility of Claim 13, further comprising a leak detection device connecting into said interior chamber space through a portal formed in a selected said sidewall.

15. A dust testing facility for testing environmental road dust affects upon a motor vehicle, comprising:

- a dust testing chamber having an interior chamber space structured to receive therewithin a motor vehicle, said dust testing chamber  
5    comprising a ceiling, an oppositely disposed flooring group and a plurality of sidewalls disposed between said ceiling and said flooring group, said ceiling,

flooring group and sidewalls collectively defining said interior chamber space;

10 a motor vehicle located within said interior chamber space, said motor vehicle having an interior vehicle space;

an air supply system configured to supply flowing air to said dust testing chamber;

road dust;

15 a dust supply system configured to fluidize said road dust and provide a mixture of fluidized road dust and compressed air;

a dust spray system mounted within said dust testing chamber adjacent said ceiling and connected to said dust supply system, said dust spray system being configured to provide clouding of said road dust within said interior chamber space in response to receiving the mixture of the

20 fluidized road dust and compressed air from said dust spray system;

a dust recapture system connected between said flooring group and said air supply system, wherein the road dust sprayed into said dust testing chamber by said dust spray system is returned to said dust supply system, and wherein the flowing air introduced into said dust testing

25 chamber is recycled to said air supply system; and

a leak detection device communicating with said vehicle interior space.

16. The facility of claim 15, wherein said dust recapture system comprises:

said flooring group comprising a floor grating; a plenum below said floor grating and a plurality of return ducts interfaced with said plenum

5 and fluidically communicating with said interior chamber space through said floor grating;

an air filtration unit structured to filter air and said road dust from said plenum and allow the flowing air to recyclably pass into said air supply system; and

10           a return dust fluidizer structured to fluidize said road dust from said plenum and return said road dust to said dust supply system.

17. The facility of Claim 16, wherein said plenum comprises a plurality of acutely angled plenum walls defining a gravitational low point running along a length of said dust testing chamber; wherein each return duct of said plurality of return ducts is located, respectively, at each  
5           gravitationally lowest point, and wherein said plurality of return ducts communicate with said air filtration unit.

18. The facility of Claim 17, wherein said air supply system comprises:

          a fan unit fluidically communicating with said air filtration unit in upstream relation therewith; and

5           temperature and humidity regulation components connected with said fan unit in downstream relation therewith, said temperature and humidity regulation components imparting the flowing air with predetermined values of relative humidity and temperature;

          wherein said air supply system is selectively adjustable to provide  
10          a first air pressure of said interior chamber space which is below atmospheric pressure; and

          wherein said leak detection device provides a second air pressure within said vehicle interior space, said second air pressure being below said first air pressure.

19. The facility of Claim 18, further comprising a source of back air pressure connected to said air filtration unit which is selectively activated

to purge said filtration unit of said road dust and thereby locate the purged road dust in said return dust fluidizer.

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20. The facility of Claim 19, wherein said road dust has a size range between substantially zero and 180 microns.